

# AUTOMATED EB BILLING SYSTEM USING GSM AND AD-HOC WIRELESS ROUTING

A.Vijayaraj\*

Associate Professor, IT Department,  
Saveetha Engineering College, Thandalam  
Chennai- 600 095, Tamil Nadu, India.  
satturvijay@yahoo.com

R.Saravanan\*\*

Associate Professor, CSE Department,  
Saveetha Engineering College, Thandalam  
Chennai- 600 095, Tamil Nadu, India

**Abstract-**With the passage of time, technology has merged itself with the daily life of humans. We have seen so much progress in the field of science and technology but we are not able to make full use of it. One such area for improvement is the Electricity board billing system. Our existing electricity board billing system in India is obsolete and time consuming. We are proposing a system through which electricity billing becomes fully automated and communication is made possible via wireless networks. The existing manual system in India has major drawbacks. This system is prone to errors and can also be easily manipulated. The prevailing manual system also requires lot of human workforce. The major disadvantage in this system is that the meter cannot be accessed by the meter reader if the customer is not present at home.

In our system the central EB office has immediate access to all consumer homes in a locality with the help of an RF system. The EB meter present in each house is connected by wireless network with the EB office which periodically gets updates from the meter. The EB office using a backend database calculates the amount to be paid according to the number of units consumed and sends it back to the meter for display and also to the user's mobile phone. The advantages of the proposed system make the existing system incompetent. It is possible to connect to remote areas even when there is a power failure as it employs wireless technology. The new system is user friendly, easy to access and far more efficient than the existing system.

**Keywords:-**Wireless Network, EB office, RF system, Mobile phone.

## I. INTRODUCTION

### 1.1. Scope of the project

The scope of this paper is to make use of new modern technologies and implement them into more practical fields. Our paper deals with the implementation of Wireless ad hoc networks in the field of electricity billing. We can make use of this technology to such an extent such that even complex problems can be handled in a easier way. Wireless networks are the eminent futuristic replacement of cables and power lines that connect every household in a particular area. This type of networks can also be used for creating emergency response networks. Our paper eliminates the need for employing EB meter readers and this set of employers can be used elsewhere.

The amount of time spent in doing all these works manually can be reduced because of this kind of network implementation. Each household is allocated a particular id so that they can be uniquely identified. There is no chance of manipulation in our proposed system. The network path is also not fixed as it based on ad hoc based routing technique we can create paths then and there. This helps in creating a dynamic environment as there is no fixed path in the network. The long queues in the billing counter can be avoided by implementing our model. This model is also cost effective, practical and efficient. The most important feature it is not dependent on electricity. The data sent by the home unit then and there is automatically stored in the back end database at the office module. So, all the data and statistics are stored in the central archives automatically just in case for future references in case of any discrepancies. This saves hours and hours of manual data entry needed for entering the data into the central system. So our module is useful in that aspect also.

### 1.2. Need for the paper:

Though many technological innovations are taking place in this world, existing electricity consumption billing process seems in India to be very obsolete and does not meet the latest technology available. In this paper, the above said process is totally automated and the communication is made possible entirely through the power line. This communication is bi-directional at a faster data rate through long distances. By digitizing, the currently used analog energy meter has been completely transformed to a digital one. Hence it is beneficial to the customers as the system is made very user friendly.

The automated EB billing procedure has the ability of fulfilling a set of needs for the user and the EB workers:

1. The automated EB billing system eliminates the need to pay the bills at the EB office
2. This system allows the user to get updated details of the power used in his house
3. The user can also verify if the bill received is the right one or not
4. Finally the wireless method sending data is feasible even when more buildings are being built into the network

**1.3. Objective of the project:**

This paper being advancement to the proposed project of sending the details to the customer house, it has a few objectives which have to be met:

1. Presence of an RF ID at each house and a central RF ID at the office to manage the RF ID at the house
2. Encryption techniques present at each house for securely sending the data
3. Matching circuit at the EB office to correctly match the house ID to the customer ID
4. A consistent database of all the details of each house

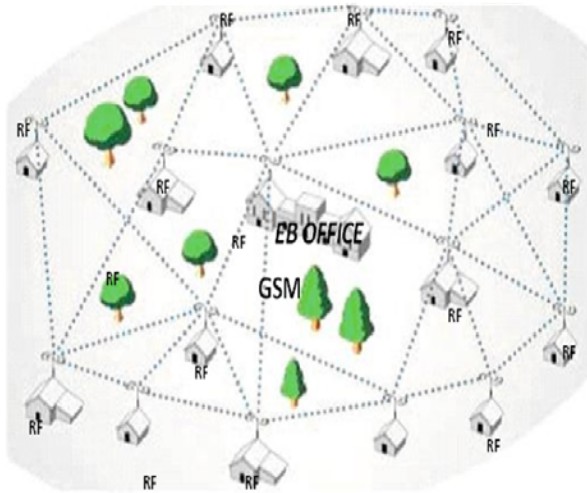


Fig-1.1 Routing network

**II. LITERATURE REVIEW**

**2.1. Prevailing System:**

The currently prevailing system involves the user to go up to the EB office to manually pay his bills. The readings are taken using the analogue meter present in the customer’s house. The readings are taken using an employee working at the EB office. This system has a set of disadvantages which are given below:

1. Erroneous Readings – This involves errors present in the meter reading which are committed due to human mistakes.
2. Easy Manipulation – Since all data here are taken manually dates’ can be easily manipulated by third parties which affect the EB office and the customer
3. Manual Labor – The amount of workforce involved in this prevailing EB system is too large as the EB people have to visit many areas at roughly the same date.
4. Time Consuming – This system takes a lot of time to go personally to the customer’s house and take

the readings.

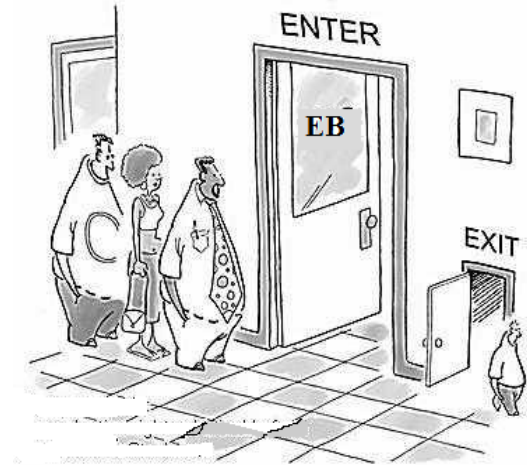


Fig-2.1 Current drawback

**2.2. Current Proposed system:**

This system has been recently proposed by the IEEE to eliminate a few drawbacks in the old EB system. This system enables the transfer of the EB details through the power lines in each house. This way the EB office employee’s just notes the readings in the customer’s house and sends the details to the EB office by any means. The user gets the details displayed in his house by the data received from the power lines. This system also has a few drawbacks which are:

1. Manual Labor – The workforce still involved here is the same as the existing system which is too vast.
2. Taking time – The way of waiting at the queues and then paying the bill is still there and this system does not help the customer in that way
3. Power Blackout – The details since sent through power lines has a problem of being delivered to far areas if certain areas have a power failure. This also delays in delivering the bill.



Fig-2.2 IEEE Ideology

**2.3. Our Proposed System:**

The system proposed by us involves a wireless method to transfer the data to the customer from the EB office. The old analogue meter reading is replaced by a digital one. This keeps on updating frequently the amount of power consumed in the house in the display. This detail is then updated once in two months to the EB office using RF. The customer meter sends its data to the EB office using the RF. The EB office calculates the data and sends the amount to be paid to the customer along with the due date. The advantages of this system are:

1. Less Labor – The vast workforce used in the earlier EB system is reduced to a very few. This workforce can also be used for other developmental purposes
2. No more Queues – The old fashioned way of paying the bills by waiting in queues are no more needed as the bills can be paid via mobiles
3. Quick updates – The amount to be paid and the due date for the bills are sent to the customer as quickly as possible through the wireless facility.
4. No manipulation – There can be no manipulation in this method as the entire process is transparent to the customer.

### III. ARCHITECTURAL DESIGN



#### 3.1. ARCHITECTURAL DESIGN

##### 3.1.1 Proposed System Architecture:

- This system automatically send SMS to customer for EB bill cost of each two months using GSM and auto billing with SMS reply systems.
- Mobile ad hoc networks are the future of wireless networks. Because they're practical, versatile, simple, easy to use and inexpensive!
- These networks provide a new approach for wireless communication and by operating in a license free frequency band prove to be relatively inexpensive.

#### 3.2 System Design

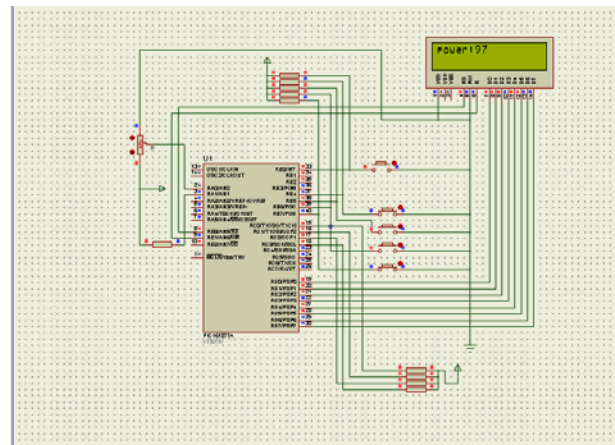


Fig-3.1 System architecture

#### 3.2.1 Module Description:

There are two modules in the automated EB billing system. They are:

##### 1. EB OFFICE MODULE:

The EB office module consists of a database at the back end for storing values which are got from the home module via RF waves. After the values are got from the home units the cost is calculated and the values are sent back to the home unit and they are displayed in the LCD display for the user to make note of it. Also the cost and amount of units are sent as a SMS to the customer's mobile phone. The data's are transmitted and received using RF transmitter and RF receiver. There is an encoder and decoder both at the central office and also at the individual home units. This facilitates secure transmission and reception in the system. The max232 interfacing is done for reducing the voltage flow from 7.5-15v to 0-5v .this will prevent the circuit from melting.

##### EBOffice

##### Module:

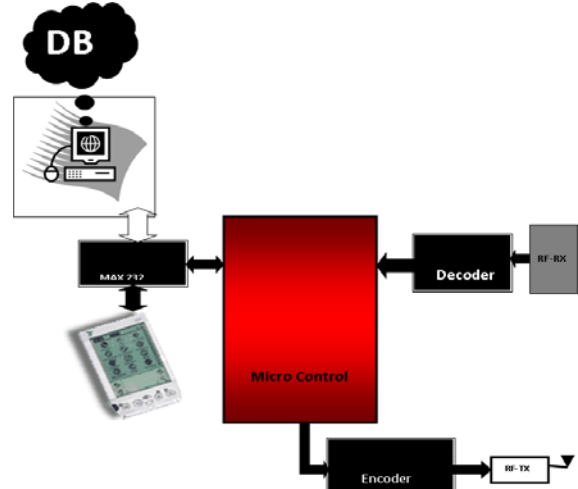


Fig-3.2 Module 1-Block diagram

##### 2. CUSTOMER HOME MODULE:

The home unit consists of a LCD display unit and a decoder and an encoder. The major component of the home

interface is the PIC 16F877A which has a 256bytes PROM memory. The unique id which is assigned to each home unit is stored in this memory. The microcontroller checks the message which reaches from the central EB office if the destination id matches its id then the work is done else the message is passed on to the next unit in the network. The home unit is connected to the EB office via RF frequency waves which transmit data to the EB office. The PIC microcontroller automatically sends the number of units consumed by the customer to the EB office after a particular duration of time say two months. This message is used to update the back end database and the computation is done. The EB office sends the bill back to the home unit which is displayed on the LCD display. The user is also intimated by a SMS which is sent to his/her mobile phone.

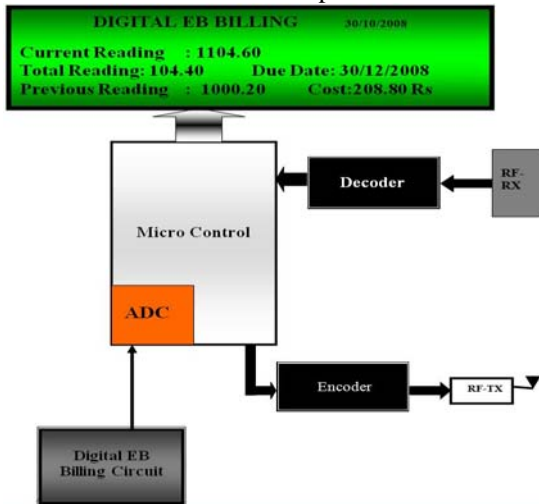


Fig-3.3 Module 2-Block diagram

#### IV. TESTING AND MAINTENANCE

When a system is developed, it is expected that it performs properly. In practice, some errors always occur. The main purpose of testing a system is to find the errors and correct them. A successful test is one, which finds an error. The main objectives of the system testing are

- To ensure during the operation that the system will perform as per specified in the design phase.
- To make sure that the system meets user requirements during operations
- To verify that the controls incorporated in the system functions as intended
- To see that if correct inputs are fed into the system, it provides perfect output
- To verify that during operation incorrect input processing and output will be deleted.

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. As a second benefit, testing documents that the software function appears to be

working according to the specification and the performance requirements appear to have been made.

The scope of the system test should include both manual operations and computer operations. System testing is a comprehensive evaluation of the programs, manual procedures, computer operations and controls.

#### V. CONCLUSION

This proposed Automated EB model includes an office module which has a PC with its back end connected to a database. The other module is the customer home module which is present at the home this module is used to make note of the amount of power consumed by the customer and after a period of 2 months it sends the PC in the EB office. This EB office module calculates the data and sends it to the customer along with the due date. The customer also gets details of the bill on his mobile phone through which he can pay the bill. The advantages of this Model are:

- Automation of all features including communication from the EB office to the customer.
- Saves data using automatic control and storage systems.
- It involves less cost to communicate.
- This system increases productivity.
- To increase n number of customers to communicate and automate.

#### VI. FUTURE ENHANCEMENTS

This paper has been stated for the use of EB billing purposes for a locality. This same technique of RF signaling and Ad-Hoc data transfer can be used in various other fields like disaster management for sending data to the relief centers. This technology can also be used in sending messages and information to nearby hospitals in emergency situations like in case of natural calamities.

#### REFERENCES

1. Wireless Network:
  1. "Overview of Wireless Communications". cambridge.org
  2. "Getting to Know Wireless Networks and Technology". informit.com.
  3. "Global System for Mobile Communication (GSM)". iec.org
2. Ad-Hoc:
  1. Carroll, Robert T. "Ad hoc hypothesis." *The Skeptic's Dictionary*. <<http://skeptdic.com/adhoc.html>>.
  2. Texas A&M University. "Einstein's Biggest Blunder? Dark Energy May Be Consistent With Cosmological Constant." *ScienceDaily*
3. PIC microcontroller:
  1. "PIC micro Family Tree", PIC16F Seminar Presentation [http://www.microchip.com.tw/PDF/2004\\_spring/PIC16F%20seminar%20presentation.pdf](http://www.microchip.com.tw/PDF/2004_spring/PIC16F%20seminar%20presentation.pdf)
  2. Microchip Technology (2008-02-27). *Microchip Technology Delivers Six Billionth PIC Microcontroller*. Press release.
4. Radio Frequency (RF)
  1. RF System Design Of Transceivers For Wireless Communications by Qizheng Gu (Author)

**Author profile:**



**A.Vijayaraj** is an Associate Professor in Department of Information Technology at Saveetha Engineering College. He received his Master of Computer Application in Bharathidhasan University, in 1997 and his Master of Engineering in Computer Science and Engineering from Sathyabama University at 2005.

He has 12 years of teaching experience from various Engineering Colleges during tenure he was Awarded **Best Teacher Award** twice..He is a Member of, CSI and ISTE. He has Published 2 papers In International journal 10 Papers in International and National Level conferences. His area of interest includes Operating Systems, Data Structures, Networks and Communication.



**R.Saravanan** is an Associate Professor in Department of Computer Science and Engineering at Saveetha Engineering College. He received his Master of Computer Application in Manonmaniam Sundaranar University, in 1995 and his Master of Engineering in Computer Science and Engineering from

Sathyabama University at 2005. He has 13 years of teaching experience from various Engineering Colleges during tenure he was Awarded **Best Teacher Award**. He is a Member of ISTE. He has 7 Papers in International and National Level conferences. His area of interest includes Data Mining, Computer Architecture, Object Oriented Programming, Operating Systems, Mobile computing and Database Management Systems.